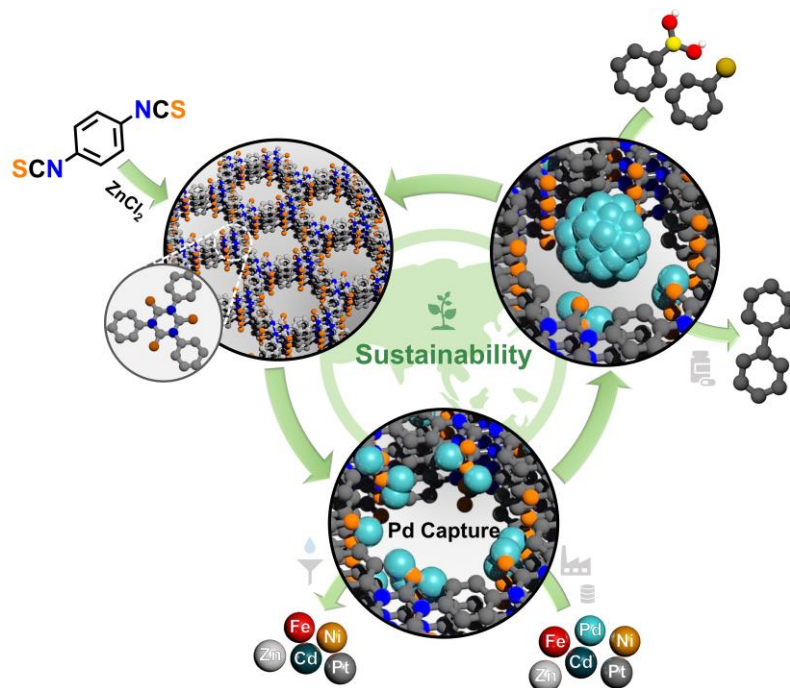


Porous Polyisothiocyanurates for Selective Palladium Recovery and Heterogeneous Catalysis

Kyung Seob Song,^a Timur Ashirov,^a Siddulu Naidu Talapaneni, Adam Hugh Clark, Alexander Yakimov, Maarten Nachtegaal, Christophe Copéret and Ali Coskun^a

^a Department of Chemistry, University of Fribourg, Switzerland
kyungseob.song@unifr.ch

Palladium (Pd) is an indispensable metal due to its wide range of industrial applications. Pd refining, however, is an extremely energy intensive process with a serious environmental impact (e.g. 3.88 tons CO₂ emission per 1 kg of Pd production). Therefore, the selective recovery of Pd from secondary sources is rather important. Heterogeneous sorbents are promising candidates owing to their reusability. Here, we present the synthesis of porous polyisothiocyanurates through the trimerization of 1,4-phenyldiisothiocyanate under ionothermal conditions, named Covalent Isothiocyanurate Frameworks (CITCFs)^[1], bearing in-situ generated thiourea moieties as binding sites for Pd(II). High surface area of CITCFs, 1589 m² g⁻¹, along with the presence of abundant sulfur atoms within a hierarchically porous network enabled an exceptional Pd(II) uptake capacity of 909.1 mg g⁻¹, fast adsorption kinetics, stable uptake over a wide pH range and selective Pd(II) recovery from wastewater conditions using batch- and breakthrough test. We observed the exact binding site of Pd into our sorbent through interdisciplinary research. Moreover, the reduction of recovered Pd(II) within the polymer networks led to highly efficient heterogeneous catalysts for the Suzuki-Miyaura cross-coupling reaction.



[1] K.S. Song, T. Ashirov, S. N. Talapaneni, A. H. Clark, A. Yakimov, M. Nachtegaal, C. Copéret, A. Coskun, *Chem*, 2022, 8, 2043-2059